

$$\dot{m}_{\text{bk gnd}} = x_{\text{dil/exh}} \cdot \dot{m}_{\text{bk gndd exh}}$$

Eq. 1065.667-3

$$\dot{m}_{\text{bk gndd exh}} = M \cdot x_{\text{bk gnd}} \cdot \dot{n}_{\text{d exh}}$$

Eq. 1065.667-4

*Example:*

$M_{\text{NO}_x} = 46.0055 \text{ g/mol}$   
 $x_{\text{bk gnd}} = 0.05 \text{ } \mu\text{mol/mol} = 0.05 \cdot 10^{-6} \text{ mol/mol}$   
 $\dot{n}_{\text{d exh}} = 23280.5 \text{ mol/s}$   
 $x_{\text{dil/exh}} = 0.843 \text{ mol/mol}$   
 $\dot{m}_{\text{bk gndNO}_x\text{d exh}} = 46.0055 \cdot 0.05 \cdot 10^{-6} \cdot 23280.5$   
 $\dot{m}_{\text{bk gndNO}_x\text{d exh}} = 0.0536 \text{ g/hr}$   
 $\dot{m}_{\text{bk gndNO}_x} = 0.843 \cdot 0.0536$   
 $\dot{m}_{\text{bk gndNO}_x} = 0.0452 \text{ g/hr}$

[76 FR 57465, Sept. 15, 2011]

#### § 1065.670 NO<sub>x</sub> intake-air humidity and temperature corrections.

See the standard-setting part to determine if you may correct NO<sub>x</sub> emissions for the effects of intake-air humidity or temperature. Use the NO<sub>x</sub> intake-air humidity and temperature corrections specified in the standard-setting part instead of the NO<sub>x</sub> intake-air humidity correction specified in this part 1065. If the standard-setting part does not prohibit correcting NO<sub>x</sub> emissions for intake-air humidity according to this part 1065, correct NO<sub>x</sub> concentrations for intake-air humidity as described in this section. See § 1065.650(c)(1) for the proper sequence for applying the NO<sub>x</sub> intake-air humidity and temperature corrections. You may use a time-weighted mean combustion air humidity to calculate this correction if your combustion air hu-

midity remains within a tolerance of  $\pm 0.0025 \text{ mol/mol}$  of the mean value over the test interval. For intake-air humidity correction, use one of the following approaches:

See the standard-setting part to determine if you may correct NO<sub>x</sub> emissions for the effects of intake-air humidity or temperature. Use the NO<sub>x</sub> intake-air humidity and temperature corrections specified in the standard-setting part instead of the NO<sub>x</sub> intake-air humidity correction specified in this part 1065. If the standard-setting part does not prohibit correcting NO<sub>x</sub> emissions for intake-air humidity according to this part 1065, first apply any NO<sub>x</sub> corrections for background emissions and water removal from the exhaust sample, then correct NO<sub>x</sub> concentrations for intake-air humidity. You may use a time-weighted mean combustion air humidity to calculate this correction if your combustion air humidity remains within a tolerance of  $\pm 0.0025 \text{ mol/mol}$  of the mean value over the test interval. For intake-air humidity correction, use one of the following approaches:

(a) For compression-ignition engines, correct for intake-air humidity using the following equation:

$$x_{\text{NO}_x\text{cor}} = x_{\text{NO}_x\text{uncor}} \cdot (9.953 \cdot x_{\text{H}_2\text{O}} + 0.832) \quad \text{Eq. 1065.670-1}$$

*Example:*

$x_{\text{NO}_x\text{uncor}} = 700.5 \text{ } \mu\text{mol/mol}$   
 $x_{\text{H}_2\text{O}} = 0.022 \text{ mol/mol}$   
 $x_{\text{NO}_x\text{cor}} = 700.5 \cdot (9.953 \cdot 0.022 + 0.832)$

 $x_{\text{NO}_x\text{cor}} = 736.2 \text{ } \mu\text{mol/mol}$ 

(b) For spark-ignition engines, correct for intake-air humidity using the following equation:

$$x_{\text{NOxcor}} = x_{\text{NOxuncor}} \cdot (18.840 \cdot x_{\text{H}_2\text{O}} + 0.68094) \quad \text{Eq. 1065.670-2}$$

*Example:*

$$x_{\text{NOxuncor}} = 154.7 \text{ } \mu\text{mol/mol}$$

$$x_{\text{H}_2\text{O}} = 0.022 \text{ mol/mol}$$

$$x_{\text{NOxcor}} = 154.7 \cdot (18.840 \cdot 0.022 + 0.68094)$$

$$x_{\text{NOxcor}} = 169.5 \text{ } \mu\text{mol/mol}$$

(c) Develop your own correction, based on good engineering judgment.

[75 FR 23056, Apr. 30, 2010, as amended at 76 FR 57466, Sept. 15, 2011]

#### § 1065.672 Drift correction.

(a) *Scope and frequency.* Perform the calculations in this section to determine if gas analyzer drift invalidates the results of a test interval. If drift does not invalidate the results of a test interval, correct that test interval's gas analyzer responses for drift according to this section. Use the drift-corrected gas analyzer responses in all subsequent emission calculations. Note that the acceptable threshold for gas analyzer drift over a test interval is specified in §1065.550 for both laboratory testing and field testing.

(b) *Correction principles.* The calculations in this section utilize a gas analyzer's responses to reference zero and span concentrations of analytical

gases, as determined sometime before and after a test interval. The calculations correct the gas analyzer's responses that were recorded during a test interval. The correction is based on an analyzer's mean responses to reference zero and span gases, and it is based on the reference concentrations of the zero and span gases themselves. Validate and correct for drift as follows:

(c) *Drift validation.* After applying all the other corrections—except drift correction—to all the gas analyzer signals, calculate brake-specific emissions according to §1065.650. Then correct all gas analyzer signals for drift according to this section. Recalculate brake-specific emissions using all of the drift-corrected gas analyzer signals. Validate and report the brake-specific emission results before and after drift correction according to §1065.550.

(d) *Drift correction.* Correct all gas analyzer signals as follows:

(1) Correct each recorded concentration,  $x_i$ , for continuous sampling or for batch sampling,  $\bar{x}$ .

(2) Correct for drift using the following equation:

$$x_{\text{idriftcorrected}} = x_{\text{refzero}} + (x_{\text{refspan}} - x_{\text{refzero}}) \cdot \frac{2x_i - (x_{\text{prezero}} + x_{\text{postzero}})}{(x_{\text{prespan}} + x_{\text{postspan}}) - (x_{\text{prezero}} + x_{\text{postzero}})}$$

Eq. 1065.672-1

Where:

$x_{\text{idriftcorrected}}$  = concentration corrected for drift.  
 $x_{\text{refzero}}$  = reference concentration of the zero gas, which is usually zero unless known to be otherwise.

$x_{\text{refspan}}$  = reference concentration of the span gas.

$x_{\text{prespan}}$  = pre-test interval gas analyzer response to the span gas concentration.

$x_{\text{postspan}}$  = post-test interval gas analyzer response to the span gas concentration.

$x_i$  or  $\bar{x}$  = concentration recorded during test, before drift correction.

$x_{\text{prezero}}$  = pre-test interval gas analyzer response to the zero gas concentration.

$x_{\text{postzero}}$  = post-test interval gas analyzer response to the zero gas concentration.

*Example:*

$$x_{\text{refzero}} = 0 \text{ } \mu\text{mol/mol}$$

$$x_{\text{refspan}} = 1800.0 \text{ } \mu\text{mol/mol}$$

$$x_{\text{prespan}} = 1800.5 \text{ } \mu\text{mol/mol}$$

$$x_{\text{postspan}} = 1695.8 \text{ } \mu\text{mol/mol}$$

$$x_i \text{ or } \bar{x} = 435.5 \text{ } \mu\text{mol/mol}$$

$$x_{\text{prezero}} = 0.6 \text{ } \mu\text{mol/mol}$$

$$x_{\text{postzero}} = -5.2 \text{ } \mu\text{mol/mol}$$